Image AF/1763 #

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants:

Steven A. VAN SLYKE, *et al.*

Serial No.: 09/996,415

Filed: 28 November 2001

Group Art Unit: 1763

Examiner: R. Bueker

Attorney Docket No.: 83401RLO
(Rossi Docket No: KODA:296)

For: THERMAL PHYSICAL VAPOR DEPOSITION SOURCE FOR MAKING AN ORGANIC LIGHT-EMITTING DEVICE

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By:
Marc A. Rossi

APPEAL BRIEF WITH FEE

Sir:

Appellants appeal claims 1-18, as rejected in the June 4, 2003 Final Rejection. Appellants filed a Notice of Appeal on October 8, 2003. This Appeal Brief is timely. Original and two copies of the Appeal Brief are enclosed.

The fee for filing this Appeal is $330. The Commissioner is authorized to charge $330 (or any additional fees required to maintain the pendency of this application) to Deposit Account No. 18-2056.

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Real Party in Interest - Rule 192(c)(1)

The real party in interest is EASTMAN KODAK COMPANY.

Related Appeals and Interferences - Rule 192(c)(2)

No related appeal or interference that would directly affect or have affect or bearing on the Board's decision in this appeal is believed to exist. Appellants will identify any such appeal or interference if it exists.

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Claims 1-18 are pending. No claim has been allowed. Claims 1-18 have been rejected as follows:

1. Claims 1, 3-6, 15, and 17 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Spahn (USP 6,237,529) in view of Green (USP 5,584,935) and Yamazaki (US App. 2001/0006827) and Soden (USP 5,532,102).
2. Claims 2, 8-14, 16, and 18 stand finally rejected under § 103(a) as unpatentable over Spahn in view of Green, Yamazaki, Soden, Tanabe (USP App. 2001/0008121), and Takagi (USP 4,197,814).
3. Claims 7 and 12-14 stand finally rejected under § 103(a) as unpatentable over Spahn in view of Green, Yamazaki, Soden, Tanabe, Takai, and Strebe (USP 4,233,937).

The non-art rejection, along with the first two art rejections identified in the Final rejection, namely the rejections not relying on Soden, have been withdrawn per the Advisory Action. See below.

Status of Amendment(s) - Rule 192(c)(4)

Appellants filed an Amendment after Final on September 4, 2003. In reply, the examiner issued an Advisory Action dated October 3, 2003, stating that the September 4, 2003 Amendment will be entered upon filing an Appeal Brief, and the non-art rejection, along with the first two art rejections in the Final rejection. Accordingly, appellants appeal claims 1-18 as amended by the September 4, 2003 Amendment. A copy of the claims involved in this appeal is appended hereto.

Summary of the Invention - Rule 192(c)(5)

The present invention relates to a thermal physical vapor deposition source for forming an organic light-emitting device (OLED). See the Field of the Invention on page 1 and Figs. 4-8. The present device deposits a layer of vaporized organic material onto a surface of a substrate 11 or structure in a chamber 150C (Fig. 7) at reduced pressure by vaporizing solid organic material.

The present device includes a bias heater 20, an electrically insulative container 30, a vaporization heater 40, and means for moving the source relative to the structure to form a substantially uniform organic layer on the structure.

Referring to Figs. 7 and 8, the moving means can comprise a carriage/rail arrangement for moving the heating arrangement (bias heater 20, container 30, and the vaporization heater 40) as a unit relative to the structure, which can be held stationary above the heating arrangement. See page 11, lines 3-16.

The bias heater 20 has side walls 22, 24, 26, 28 and a bottom wall 25. The side walls have a height of H_B. See page 8, lines 13-22. Referring to Fig. 7, the bias heater has an associated power supply 520 for applying an electrical potential thereto to heat the solid organic material in the container. The bias heater provides a controlled bias temperature, which is insufficient to vaporize the solid organic material to vaporize. See the last paragraph of page 11 and the first paragraph of page 12.

The electrically insulative container 30, which has side walls 32, 34, 36, 38 and a bottom wall 35, is disposed in the bias heater 20 for receiving vaporizable solid organic material. The side walls of the container have a height H_C that is greater than the height H_B of the bias heater side walls. See page 8, lines 23-30.

The vaporization heater 40 is disposed on the upper side wall surfaces of the container, and has a vapor efflux slit aperture 42 extending into the container for permitting vaporized organic material to pass therethrough and onto the surface of the structure. The container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater. Referring to Fig. 7, the vaporization heater has a power supply for applying an electrical potential thereto to controllably heat the uppermost portion of the container to vaporize

the solid organic material in the container and allow vaporized organic material to escape through the efflux slit aperture to provide an organic layer on the structure. The vaporization heater power supply is separate from the bias heater power supply. See the paragraph spanning pages 12-13 and the first full paragraph of page 13.

Referring to Fig. 7, the vaporization heater also can be associated with a deposition rate-measuring device 420 to controllably apply an electrical potential to the vaporization heater in response to a control signal provided by the deposition rate-measuring device to cause controlled vaporization heat to be applied to uppermost portions of the solid organic material in the container. See the paragraph spanning pages 12-13.

Issues On Appeal - Rule 192(c)(6)

Whether the applied references would have rendered claims 1-18 obvious within the meaning of § 103.

Grouping of Claims - Rule 192(c)(7)

The claims on appeal contain two independent claims, claims 1 and 2. For purposes of this appeal, to the extent that claims 1 and 2 contain common features at issue, appellants group these claims together. Claims 2-18 thus rise or fall with claim 1.

APPELLANTS' ARGUMENT - Rule 192(c)(8)

THERE WOULD NOT HAVE BEEN ANY MOTIVATION TO INCLUDE TWO INDEPENDENTLY CONTROLLED HEATERS IN SPAHN

Claims 1 and 2 both call for a bias heater, an electrically insulative container disposed in the bias heater, and a vaporization heater disposed on the upper side walls of the container. The container is made taller than the bias heater to electrically isolate the bias heater from the vaporization heater so that separate power supplies can be provided for the bias heater and the vaporization heater. The bias heater provides a controlled bias temperature that is **insufficient** to

cause the solid organic material to vaporize. The vaporization heater controllably heats the uppermost portions of the solid organic material in the container to vaporize it and allow the vaporized organic material to project onto a structure. Appellants submit that the combination would not have taught such a structure.

First, appellants have previously argued that Spahn does not disclose providing two discrete, independently controlled heaters. In reply, the examiner argues that Spahn discloses two discrete sets of heaters because it has two sets of electrical connectors connected to different parts of the housing 10:

> Spahn, in the paragraph bridging columns 7 and 8, teaches that his container housing is provided with electrical connecting flanges 11 and 13, which are separate from the electrical connecting flanges 21 and 23 of the top plate. While both sets of electrical connectors are connected to the same power source, the top plate 20 and the container housing 10 have separate electrical connectors, and also have separate heating functions or purposes. [Advisory Action, Continuation of ¶ 5].

Appellants disagree with the examiner's assessment above because the two electrical connectors are connected to the same power source. Accordingly, they are not discrete and independently controlled. Specifically, the examiner's argument refers to the embodiment of Fig. 6. In this embodiment, while the flanges 21 and 23 of the top plate 20 and the upper flanges 11 and 13 of the housing 10 are separate connectors, the examiner fails to account for the flanges contacting each other. That is, the flanges 21 and 11 contact each other, as do the flanges 23 and 13. See Spahn, column 8, lines 1-5. This arrangement is no different from the embodiment schematically illustrated in Spahn's Fig. 4. Indeed, Spahn discloses a top plate 20 and a housing 10 made of metals with high electrical resistivity. Spahn specifically teaches heating BOTH the top plate 20 and the housing 10 together by passing a current through these components using a SINGLE power source to vaporize the solid organic material in its container.

Second, the examiner correctly acknowledges that Spahn does not teach using separate power sources (as required by claim 1) for heating the top plate 20 and for heating the housing 10.

Third, the examiner argues that Spahn teaches (in column 8,lines 12-15) vaporization heating the top plate 20, while bias-level heating the container to enhance slow outgassing. See the Advisory Action, Continuation of ¶ 5. But because of Spahn's shortcomings identified above, the examiner relies upon Soden for the proposition that having two discrete or independent heaters would have been obvious.

For purposes of this appeal, while appellants acknowledge the issues identified by the examiner in the Advisory Action, the main issue germane to patentability can be streamlined to *whether Spahn would have been sufficiently motivated to provide two discrete heaters, with independent power supplies.* Appellants submit that Spahn would not have been motivated to include independent heaters with separate power supplies, such as disclosed by Soden, because its vaporization/bias heating arrangement is specifically adapted to function with a single power source, with a fixed relative heat setting.

Referring to Fig. 7, Soden provides two discrete heaters, namely the crucible heater 65a and the surface heater 65b. Soden has to have two discrete heaters to compensate for the temperature change in the surface 47 during the vaporization coating. Note that Soden's crucible heater 65a is for vaporizing the material. Soden specifically requires that the surface heater 65b independently heat to at least the crucible temperature (where the material exits the crucible):

> Alternatively, as illustrated schematically in FIG. 7, surface 47 and crucible 51 can each be coupled to independent heat sources, thereby enabling independent control of the temperature of and within crucible 51 and the temperature of surface 47. In either event, however, surface 47 is maintained at either the same temperature as crucible 51 or at a temperature greater than that of crucible 51 during the vacuum evaporation process. [Soden, column 22, lines 42-49].

Indeed, the reason for Soden to include a separate surface heater 65b is so that the temperature of the surface 47 at the upper region does not become lower than the crucible temperature, which can condense the already vaporized material:

> When the desired evaporation temperature is reached, however, the current passing through crucible 51 is usually reduced and the temperature of surface 47 may fall to that of crucible 51. It is important, however, that surface 47 be at either the same temperature as crucible 51 or at a temperature greater than that of crucible 51 during the vacuum evaporation process. If the temperature of surface 47 falls below that of crucible 51, material 60 may condense on surface 47, which results in blockage of apertures 46, ... [Soden, column 22, lines 29-37].

It is clear from Soden's description that the surface heater 65b is to solve the condensing problem associated with changing or lowering of the temperature of the crucible once the vaporization temperature is reached. The condensation problem arises because Soden's crucible heater 65a is a vaporization heater 60. That is, Soden's crucible heater 65a is not a bias heater. See Soden, column 21, lines 47-60; column 22, lines 4-9 and lines 23-26. Soden has to provide independent control because Soden has to reduce the temperature of the crucible 51 once it reaches the desired evaporation temperature. This reduces the temperature of its surface 47. To prevent that from happening, the temperature of the surface 47 needs to be raised independently of the temperature of the crucible 51. Soden thus operates its heaters 65a, 65b inversely. That is, if the heat setting of the crucible heater 65a is lowered, the heat setting of the surface heater 65b has to be raised to prevent condensation, and vice versa.

One of ordinary skill in the art would not have looked to independently controlling the vaporization/bias-level heating in Spahn because there is simply no need for it. In Spahn, its bias-level heating arrangement is not designed to vaporize the material, but to heat the material to a temperature that is insufficient to vaporize the same. Spahn has no need for independently controlling its vaporization heating arrangement since the temperature of its bias-level heating

arrangement is preset. Whereas Soden needs to lower the temperature of its crucible heater 65b once it reaches a vaporization temperature, Spahn's device is designed to heat the top plate 20 and the housing 10 in unison. That is, Spahn is specifically designed to operate with a single power source so that the relative heating requirement between its container 10 and the top plate 20 is FIXED. Specifically, Spahn achieves a fixed relative heat setting by appropriately selecting the thickness of the resistively heatable top plate 20 and the wall thickness of the container 10. The setting remains fixed so that the top plate always runs at a higher temperature. See Spahn, column 8, lines 5-14. Spahn simply has not need to deviate from its fixed relative temperature setting.

To the extent that the examiner is arguing that providing independent control regardless of the need, but as matter of expediency, appellants submit that providing independent temperature control would unnecessarily complicate the operation of Spahn, provide unnecessary control, and provide no benefit or advantage. As it provides no advantage or any benefit or improve the device of Spahn, one of ordinary skill in the art would not have been motivated to look toward Soden for improving its device.

Conclusion

For the foregoing reasons, appellants submit that the pending claims would have patentably distinguished over the applied combination. Appellants therefore respectfully urge the Board to reverse the rejection of these claims.

Respectfully submitted,

Date: 12-08-03

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CLAIMS ON APPEAL - Rule 192(c)(9)

1. A thermal physical vapor deposition source for vaporizing solid organic materials and applying a vaporized organic material as a layer onto a surface of a structure in a chamber at reduced pressure in forming an organic light-emitting device (OLED), comprising:

a) a bias heater defined by side walls and a bottom wall, the side walls having a height dimension H_B;

b) an electrically insulative container disposed in the bias heater for receiving vaporizable solid organic material, the container being defined by side walls and a bottom wall, and the container side walls having a height dimension H_C which is greater than the height dimension H_B of the bias heater side walls;

c) a vaporization heater disposed on upper side wall surfaces of the container, the vaporization heater defining a vapor efflux slit aperture extending into the container for permitting vaporized organic material to pass through the slit aperture and onto the surface of the structure, wherein the container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater;

d) a bias heater power supply for applying an electrical potential to the bias heater to cause bias heat to be applied to the solid organic material in the container, the bias heater providing a controlled bias temperature which is insufficient to cause the solid organic material to vaporize;

e) a vaporization heater power supply for applying an electrical potential to the vaporization heater to controllably heat uppermost portions of the solid organic material in the container to vaporize the solid organic material and allow vaporized organic material to project onto the structure through the efflux slit aperture to provide an organic layer on the structure, wherein the vaporization heater power supply is separate from the bias heater power supply; and

f) means for providing relative motion between the vapor deposition source and the structure to provide a substantially uniform organic layer on the structure.

2. A thermal physical vapor deposition source for vaporizing solid organic materials and applying a vaporized organic material as a layer onto a surface of a structure in a chamber at

reduced pressure in forming an organic light-emitting device (OLED), comprising:

a) a bias heater defined by side walls and a bottom wall, the side walls having a height dimension H_B;

b) an electrically insulative container disposed in the bias heater for receiving vaporizable solid organic material, the container being defined by side walls and a bottom wall, and the container side walls having a height dimension H_C which is taller than the height dimension H_B of the bias heater side walls;

c) a vaporization heater disposed on upper side wall surfaces of the container, the vaporization heater defining a vapor efflux slit aperture extending into the container for permitting vaporized organic material to pass through the slit aperture and onto the surface of the structure, wherein the container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater;

d) a bias heater power supply for controllably applying an electrical potential to the bias heater in response to a control signal provided by a bias heater temperature measuring device to cause controlled bias heat to be applied to the solid organic material in the container, the controlled bias heat providing a bias temperature which is insufficient to cause the solid organic material to vaporize;

e) a vaporization heater power supply for controllably applying an electrical potential to the vaporization heater in response to a control signal provided by a deposition rate-measuring device to cause controlled vaporization heat to be applied to uppermost portions of the solid organic material in the container, causing such uppermost portions to controllably vaporize so that vaporized organic material is projected onto the structure through the efflux slit aperture to provide an organic layer on the structure, wherein the vaporization heater power supply is separate from the bias heater power supply; and

f) means for providing relative motion between the vapor deposition source and the structure to provide a substantially uniform organic layer on the structure.

3. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes doped or undoped hole-injecting material, doped or undoped organic hole-transporting material, doped or undoped organic light-emitting material, or doped or undoped organic electron-transporting material.

4. The thermal physical vapor deposition source of claim 1 wherein the electrically insulative container is constructed of quartz or of a ceramic material.

5. The thermal physical vapor deposition source of claim 3 wherein the solid organic material received in the container includes powder, flakes, or particulates, and the vaporization heater further includes a baffle member connected to the vaporization heater and spaced therefrom in a direction towards the container, the baffle member substantially preventing ejection of particles of powder, flakes, or particulates through the vapor efflux slit aperture and permitting vaporized organic material to pass through the slit aperture.

6. The thermal physical vapor deposition source of claim 3 wherein the solid organic material received in the container includes at least one solid pellet of such organic material.

7. The thermal physical vapor deposition source of claim 1 wherein the means for providing relative motion between the vapor deposition source and the structure includes a lead screw adapted either to move the source with respect to a fixedly disposed structure, or to move the structure with respect to a fixedly disposed source.

8. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes doped or undoped hole-injecting material, doped or undoped organic hole-transporting material, doped or undoped organic light-emitting material, or doped or undoped organic electron-transporting material.

9. The thermal physical vapor deposition source of claim 2 wherein the electrically insulative container is constructed of quartz or of a ceramic material.

10. The thermal physical vapor deposition source of claim 8 wherein the solid organic material received in the container includes powder, flakes, or particulates, and the vaporization heater further includes a baffle member connected to the vaporization heater and spaced therefrom in a direction towards the container, the baffle member substantially preventing ejection of particles of powder, flakes, or particulates through the vapor efflux slit aperture and permitting vaporized organic material to pass through the slit aperture.

11. The thermal physical vapor deposition source of claim 8 wherein the solid organic material received in the container includes at least one solid pellet of such organic material.

12. The thermal physical vapor deposition source of claim 2 wherein the means for providing relative motion between the vapor deposition source and the structure includes a lead screw adapted either to move the source with respect to a fixedly disposed structure, or to move the structure with respect to a fixedly disposed source.

13. The thermal physical vapor deposition source of claim 2 wherein the bias heater temperature-measuring device includes a pyrometer for measuring the temperature of the bias heater in a parked position of the vapor deposition source, the pyrometer providing a control signal corresponding to the temperature of the bias heater, and the control signal controlling a bias heater power supply for controllably applying an electrical potential to the bias heater.

14. The thermal physical vapor deposition source of claim 2 wherein the bias heater measuring device includes a thermocouple attached to the bias heater for measuring the temperature of the bias heater in at least a parked position of the vapor deposition source, the thermocouple providing a control signal corresponding to the temperature of the bias heater, and

the control signal controlling a bias heater power supply for controllably applying an electrical potential to the bias heater.

15. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes one or more organic dopant materials.

16. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes one or more organic dopant materials.

17. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes one or more organic host materials.

18. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes one or more organic host materials.

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The present device includes a bias heater 20, an electrically insulative container 30, a vaporization heater 40, and means for moving the source relative to the structure to form a substantially uniform organic layer on the structure.

Referring to Figs. 7 and 8, the moving means can comprise a carriage/rail arrangement for moving the heating arrangement (bias heater 20, container 30, and the vaporization heater 40) as a unit relative to the structure, which can be held stationary above the heating arrangement. See page 11, lines 3-16.

The bias heater 20 has side walls 22, 24, 26, 28 and a bottom wall 25. The side walls have a height of H_B. See page 8, lines 13-22. Referring to Fig. 7, the bias heater has an associated power supply 520 for applying an electrical potential thereto to heat the solid organic material in the container. The bias heater provides a controlled bias temperature, which is insufficient to vaporize the solid organic material to vaporize. See the last paragraph of page 11 and the first paragraph of page 12.

The electrically insulative container 30, which has side walls 32, 34, 36, 38 and a bottom wall 35, is disposed in the bias heater 20 for receiving vaporizable solid organic material. The side walls of the container have a height H_C that is greater than the height H_B of the bias heater side walls. See page 8, lines 23-30.

The vaporization heater 40 is disposed on the upper side wall surfaces of the container, and has a vapor efflux slit aperture 42 extending into the container for permitting vaporized organic material to pass therethrough and onto the surface of the structure. The container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater. Referring to Fig. 7, the vaporization heater has a power supply for applying an electrical potential thereto to controllably heat the uppermost portion of the container to vaporize

the solid organic material in the container and allow vaporized organic material to escape through the efflux slit aperture to provide an organic layer on the structure. The vaporization heater power supply is separate from the bias heater power supply. See the paragraph spanning pages 12-13 and the first full paragraph of page 13.

Referring to Fig. 7, the vaporization heater also can be associated with a deposition rate-measuring device 420 to controllably apply an electrical potential to the vaporization heater in response to a control signal provided by the deposition rate-measuring device to cause controlled vaporization heat to be applied to uppermost portions of the solid organic material in the container. See the paragraph spanning pages 12-13.

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Whether the applied references would have rendered claims 1-18 obvious within the meaning of § 103.

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The claims on appeal contain two independent claims, claims 1 and 2. For purposes of this appeal, to the extent that claims 1 and 2 contain common features at issue, appellants group these claims together. Claims 2-18 thus rise or fall with claim 1.

APPELLANTS' ARGUMENT - Rule 192(c)(8)

THERE WOULD NOT HAVE BEEN ANY MOTIVATION TO INCLUDE TWO INDEPENDENTLY CONTROLLED HEATERS IN SPAHN

Claims 1 and 2 both call for a bias heater, an electrically insulative container disposed in the bias heater, and a vaporization heater disposed on the upper side walls of the container. The container is made taller than the bias heater to electrically isolate the bias heater from the vaporization heater so that separate power supplies can be provided for the bias heater and the vaporization heater. The bias heater provides a controlled bias temperature that is **insufficient** to

cause the solid organic material to vaporize. The vaporization heater controllably heats the uppermost portions of the solid organic material in the container to vaporize it and allow the vaporized organic material to project onto a structure. Appellants submit that the combination would not have taught such a structure.

First, appellants have previously argued that Spahn does not disclose providing two discrete, independently controlled heaters. In reply, the examiner argues that Spahn discloses two discrete sets of heaters because it has two sets of electrical connectors connected to different parts of the housing 10:

> Spahn, in the paragraph bridging columns 7 and 8, teaches that his container housing is provided with electrical connecting flanges 11 and 13, which are separate from the electrical connecting flanges 21 and 23 of the top plate. While both sets of electrical connectors are connected to the same power source, the top plate 20 and the container housing 10 have separate electrical connectors, and also have separate heating functions or purposes. [Advisory Action, Continuation of ¶ 5].

Appellants disagree with the examiner's assessment above because the two electrical connectors are connected to the same power source. Accordingly, they are not discrete and independently controlled. Specifically, the examiner's argument refers to the embodiment of Fig. 6. In this embodiment, while the flanges 21 and 23 of the top plate 20 and the upper flanges 11 and 13 of the housing 10 are separate connectors, the examiner fails to account for the flanges contacting each other. That is, the flanges 21 and 11 contact each other, as do the flanges 23 and 13. See Spahn, column 8, lines 1-5. This arrangement is no different from the embodiment schematically illustrated in Spahn's Fig. 4. Indeed, Spahn discloses a top plate 20 and a housing 10 made of metals with high electrical resistivity. Spahn specifically teaches heating BOTH the top plate 20 and the housing 10 together by passing a current through these components using a SINGLE power source to vaporize the solid organic material in its container.

Second, the examiner correctly acknowledges that Spahn does not teach using separate power sources (as required by claim 1) for heating the top plate 20 and for heating the housing 10.

Third, the examiner argues that Spahn teaches (in column 8,lines 12-15) vaporization heating the top plate 20, while bias-level heating the container to enhance slow outgassing. See the Advisory Action, Continuation of ¶ 5. But because of Spahn's shortcomings identified above, the examiner relies upon Soden for the proposition that having two discrete or independent heaters would have been obvious.

For purposes of this appeal, while appellants acknowledge the issues identified by the examiner in the Advisory Action, the main issue germane to patentability can be streamlined to *whether Spahn would have been sufficiently motivated to provide two discrete heaters, with independent power supplies*. Appellants submit that Spahn would not have been motivated to include independent heaters with separate power supplies, such as disclosed by Soden, because its vaporization/bias heating arrangement is specifically adapted to function with a single power source, with a fixed relative heat setting.

Referring to Fig. 7, Soden provides two discrete heaters, namely the crucible heater 65a and the surface heater 65b. Soden has to have two discrete heaters to compensate for the temperature change in the surface 47 during the vaporization coating. Note that Soden's crucible heater 65a is for vaporizing the material. Soden specifically requires that the surface heater 65b independently heat to at least the crucible temperature (where the material exits the crucible):

> Alternatively, as illustrated schematically in FIG. 7, surface 47 and crucible 51 can each be coupled to independent heat sources, thereby enabling independent control of the temperature of and within crucible 51 and the temperature of surface 47. In either event, however, surface 47 is maintained at either the same temperature as crucible 51 or at a temperature greater than that of crucible 51 during the vacuum evaporation process. [Soden, column 22, lines 42-49].

Indeed, the reason for Soden to include a separate surface heater 65b is so that the temperature of the surface 47 at the upper region does not become lower than the crucible temperature, which can condense the already vaporized material:

> When the desired evaporation temperature is reached, however, the current passing through crucible 51 is usually reduced and the temperature of surface 47 may fall to that of crucible 51. It is important, however, that surface 47 be at either the same temperature as crucible 51 or at a temperature greater than that of crucible 51 during the vacuum evaporation process. If the temperature of surface 47 falls below that of crucible 51, material 60 may condense on surface 47, which results in blockage of apertures 46, ... [Soden, column 22, lines 29-37].

It is clear from Soden's description that the surface heater 65b is to solve the condensing problem associated with changing or lowering of the temperature of the crucible once the vaporization temperature is reached. The condensation problem arises because Soden's crucible heater 65a is a vaporization heater 60. That is, Soden's crucible heater 65a is not a bias heater. See Soden, column 21, lines 47-60; column 22, lines 4-9 and lines 23-26. Soden has to provide independent control because Soden has to reduce the temperature of the crucible 51 once it reaches the desired evaporation temperature. This reduces the temperature of its surface 47. To prevent that from happening, the temperature of the surface 47 needs to be raised independently of the temperature of the crucible 51. Soden thus operates its heaters 65a, 65b inversely. That is, if the heat setting of the crucible heater 65a is lowered, the heat setting of the surface heater 65b has to be raised to prevent condensation, and vice versa.

One of ordinary skill in the art would not have looked to independently controlling the vaporization/bias-level heating in Spahn because there is simply no need for it. In Spahn, its bias-level heating arrangement is not designed to vaporize the material, but to heat the material to a temperature that is insufficient to vaporize the same. Spahn has no need for independently controlling its vaporization heating arrangement since the temperature of its bias-level heating

arrangement is preset. Whereas Soden needs to lower the temperature of its crucible heater 65b once it reaches a vaporization temperature, Spahn's device is designed to heat the top plate 20 and the housing 10 in unison. That is, Spahn is specifically designed to operate with a single power source so that the relative heating requirement between its container 10 and the top plate 20 is FIXED. Specifically, Spahn achieves a fixed relative heat setting by appropriately selecting the thickness of the resistively heatable top plate 20 and the wall thickness of the container 10. The setting remains fixed so that the top plate always runs at a higher temperature. See Spahn, column 8, lines 5-14. Spahn simply has not need to deviate from its fixed relative temperature setting.

To the extent that the examiner is arguing that providing independent control regardless of the need, but as matter of expediency, appellants submit that providing independent temperature control would unnecessarily complicate the operation of Spahn, provide unnecessary control, and provide no benefit or advantage. As it provides no advantage or any benefit or improve the device of Spahn, one of ordinary skill in the art would not have been motivated to look toward Soden for improving its device.

Conclusion

For the foregoing reasons, appellants submit that the pending claims would have patentably distinguished over the applied combination. Appellants therefore respectfully urge the Board to reverse the rejection of these claims.

Respectfully submitted,

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CLAIMS ON APPEAL - Rule 192(c)(9)

1. A thermal physical vapor deposition source for vaporizing solid organic materials and applying a vaporized organic material as a layer onto a surface of a structure in a chamber at reduced pressure in forming an organic light-emitting device (OLED), comprising:

a) a bias heater defined by side walls and a bottom wall, the side walls having a height dimension H_B;

b) an electrically insulative container disposed in the bias heater for receiving vaporizable solid organic material, the container being defined by side walls and a bottom wall, and the container side walls having a height dimension H_C which is greater than the height dimension H_B of the bias heater side walls;

c) a vaporization heater disposed on upper side wall surfaces of the container, the vaporization heater defining a vapor efflux slit aperture extending into the container for permitting vaporized organic material to pass through the slit aperture and onto the surface of the structure, wherein the container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater;

d) a bias heater power supply for applying an electrical potential to the bias heater to cause bias heat to be applied to the solid organic material in the container, the bias heater providing a controlled bias temperature which is insufficient to cause the solid organic material to vaporize;

e) a vaporization heater power supply for applying an electrical potential to the vaporization heater to controllably heat uppermost portions of the solid organic material in the container to vaporize the solid organic material and allow vaporized organic material to project onto the structure through the efflux slit aperture to provide an organic layer on the structure, wherein the vaporization heater power supply is separate from the bias heater power supply; and

f) means for providing relative motion between the vapor deposition source and the structure to provide a substantially uniform organic layer on the structure.

2. A thermal physical vapor deposition source for vaporizing solid organic materials and applying a vaporized organic material as a layer onto a surface of a structure in a chamber at

reduced pressure in forming an organic light-emitting device (OLED), comprising:

a) a bias heater defined by side walls and a bottom wall, the side walls having a height dimension H_B;

b) an electrically insulative container disposed in the bias heater for receiving vaporizable solid organic material, the container being defined by side walls and a bottom wall, and the container side walls having a height dimension H_C which is taller than the height dimension H_B of the bias heater side walls;

c) a vaporization heater disposed on upper side wall surfaces of the container, the vaporization heater defining a vapor efflux slit aperture extending into the container for permitting vaporized organic material to pass through the slit aperture and onto the surface of the structure, wherein the container side walls are taller than the bias heater side walls to electrically isolate the vaporization heater from the bias heater;

d) a bias heater power supply for controllably applying an electrical potential to the bias heater in response to a control signal provided by a bias heater temperature measuring device to cause controlled bias heat to be applied to the solid organic material in the container, the controlled bias heat providing a bias temperature which is insufficient to cause the solid organic material to vaporize;

e) a vaporization heater power supply for controllably applying an electrical potential to the vaporization heater in response to a control signal provided by a deposition rate-measuring device to cause controlled vaporization heat to be applied to uppermost portions of the solid organic material in the container, causing such uppermost portions to controllably vaporize so that vaporized organic material is projected onto the structure through the efflux slit aperture to provide an organic layer on the structure, wherein the vaporization heater power supply is separate from the bias heater power supply; and

f) means for providing relative motion between the vapor deposition source and the structure to provide a substantially uniform organic layer on the structure.

3. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes doped or undoped hole-injecting material, doped or undoped organic hole-transporting material, doped or undoped organic light-emitting material, or doped or undoped organic electron-transporting material.

4. The thermal physical vapor deposition source of claim 1 wherein the electrically insulative container is constructed of quartz or of a ceramic material.

5. The thermal physical vapor deposition source of claim 3 wherein the solid organic material received in the container includes powder, flakes, or particulates, and the vaporization heater further includes a baffle member connected to the vaporization heater and spaced therefrom in a direction towards the container, the baffle member substantially preventing ejection of particles of powder, flakes, or particulates through the vapor efflux slit aperture and permitting vaporized organic material to pass through the slit aperture.

6. The thermal physical vapor deposition source of claim 3 wherein the solid organic material received in the container includes at least one solid pellet of such organic material.

7. The thermal physical vapor deposition source of claim 1 wherein the means for providing relative motion between the vapor deposition source and the structure includes a lead screw adapted either to move the source with respect to a fixedly disposed structure, or to move the structure with respect to a fixedly disposed source.

8. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes doped or undoped hole-injecting material, doped or undoped organic hole-transporting material, doped or undoped organic light-emitting material, or doped or undoped organic electron-transporting material.

9. The thermal physical vapor deposition source of claim 2 wherein the electrically insulative container is constructed of quartz or of a ceramic material.

10. The thermal physical vapor deposition source of claim 8 wherein the solid organic material received in the container includes powder, flakes, or particulates, and the vaporization heater further includes a baffle member connected to the vaporization heater and spaced therefrom in a direction towards the container, the baffle member substantially preventing ejection of particles of powder, flakes, or particulates through the vapor efflux slit aperture and permitting vaporized organic material to pass through the slit aperture.

11. The thermal physical vapor deposition source of claim 8 wherein the solid organic material received in the container includes at least one solid pellet of such organic material.

12. The thermal physical vapor deposition source of claim 2 wherein the means for providing relative motion between the vapor deposition source and the structure includes a lead screw adapted either to move the source with respect to a fixedly disposed structure, or to move the structure with respect to a fixedly disposed source.

13. The thermal physical vapor deposition source of claim 2 wherein the bias heater temperature-measuring device includes a pyrometer for measuring the temperature of the bias heater in a parked position of the vapor deposition source, the pyrometer providing a control signal corresponding to the temperature of the bias heater, and the control signal controlling a bias heater power supply for controllably applying an electrical potential to the bias heater.

14. The thermal physical vapor deposition source of claim 2 wherein the bias heater measuring device includes a thermocouple attached to the bias heater for measuring the temperature of the bias heater in at least a parked position of the vapor deposition source, the thermocouple providing a control signal corresponding to the temperature of the bias heater. and

the control signal controlling a bias heater power supply for controllably applying an electrical potential to the bias heater.

15. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes one or more organic dopant materials.

16. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes one or more organic dopant materials.

17. The thermal physical vapor deposition source of claim 1 wherein the solid organic material received in the container includes one or more organic host materials.

18. The thermal physical vapor deposition source of claim 2 wherein the solid organic material received in the container includes one or more organic host materials.